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DANISH IMPERATIVE FORMATION: A PROBLEM FOR THE PHONOLOGY/MORPHOLOGY INTERFACE

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The formation of imperatives (IMP) in Danish has for centuries been a challenge, both to native speaker-hearers and for language policy, and it has been discussed in grammars since the 17th century. The best way to state the principle of IMP-formation in Danish is: IMP is formed by subtracting a final e-schwa (/ə/) from INF; if INF does not end in e-schwa (/ə/), IMP = INF. In many cases, the IMP thus constructed is not, or does not end in, a well-formed syllable, e.g. *hækl!* [hɛǧl] 'crochet!', *saml!* [sɑmˀl] 'collect!'. Such forms do not obey sonority or strength hierarchies, and there are different ways to cope with that challenge. Danish IMP-formation represents several types of conflicts with respect to the morphology/phonology interface, and it illustrates several descriptive and theoretical problems in accounting for them: both between morphology and phonotactics (sections 1 and 5), and between morphology and prosody (sections 6 on vowel quantity and section 7 on the *stød*, a laryngeal syllable rhyme prosody with a complex grammatical distribution). This paper proposes a coherent account, based upon Basbøll's Sonority Syllable Model — a non-circular cross-linguistic model of sonority or strength — (section 4), and his Non-Stød Model. The latter model involves a general procedure for the integration of suffixes in word structure (section 8) and its application to modern Danish (section 9). Throughout the paper, methodological and theoretical problems are in focus, but finally, the need for empirical investigations of Danish IMP-formation is emphasized, concerning the question how Danish speaker-listeners, and also foreign learners of Danish, cope with the challenging IMP-forms.

Keywords: imperative, Danish, phonotactics, prosody, phonology, morphology, stød.

1. THE INTERFACE PROBLEM IN DANISH IMPERATIVES (IMP)

In the comprehensive scientific grammar of Modern Standard Danish the imperative (IMP) form of verbs (in the active) is described thus:

Suffix -*0*, i.e. identical to the stem [Hansen, Heltoft, 2011, s. 731];

the authors add: for verbs [i.e. stems] ending in C + liquid l/r/n, e.g. *handle* 'trade', *padle* 'paddle', *fjumre* 'bungle' [...] *ytre* 'utter, express', *åbne* 'open', *kølne* 'cool', a supporting vowel [a schwa] is always inserted between C and l/r/n, corresponding to (unauthorized) written forms like *handel! paddel! fjummer!* [...] *ytter! åben!* E. Hansen and L. Heltoft do not quote the IMP of *kølne* here *which would actually be a counter-example to their rule since the form* køln! *(homophonous to the Danish pronunciation of the German city* ***Köln****) is a perfect monosyllable.* I return to this kind of example in section 5.

There is a *conflict* here, they say (p. 266, cf. [Hansen, 1990]) between a *morphematic* principle (IMP = STEM) and a *graphotactic* principle ('insert *e* to prevent a final consonant cluster that only occurs in IMPs'). E. Hansen and L. Heltoft claim that in the pronunciation of IMP-forms such as those mentioned above, schwa is inserted "unproblematically" (p. 266); but in fact, there are also pronunciations of e.g. *ytr!* 'utter!' *hamstr!* 'hoard!' *rafl!* 'dice!' *cykl!* 'go by bike!' which resolve the conflict in a different manner, viz. by devoicing the final consonant (cf. section 5).

The interface between phonotactics and morphology belongs to *morphonotactics*, in the terminology of Dressler & Dziubalska-Kołaczyk (2006). Danish is not alone among the Scandinavian languages to present such a morphonotactic interface problem. In the Norwegian "bokmål", or its conservative variant "riksmål", i.e. in the forms historically derived from Danish — which Haugen (1976) aptly terms *Dano-Norwegian* — a related challenge occurs, analyzed in a modern phonological framework by Kristoffersen [Kristoffersen, 2000, p. 139, 220–221], in his *Urban East Norwegian* norm (as spoken in the Oslo region and beyond). But IMP is not a similarly phonotactically problematic form in e.g. Standard Swedish, New Norwegian, or Icelandic.

There are further interface problems between morphology and phonology in Danish IMP-formation, viz. between morphology and prosody (morphoprosody, if you like): regarding vowel quantity (section 6) as well as the *stød* — the famous Danish laryngeal syllable rhyme prosody with a complicated grammatical distribution — (section 7).

2. HOW LINGUISTS HAVE DEALT WITH THE PROBLEM

Already Pontoppidan [Pontoppidan, 1668, p. 288] noticed a(n orthographical) problem here and proposed to subtract *r* from the present tense forms, e.g. *vakle!* 'stagger!' (from present *vakler*). But more importantly, Danish IMP-formation was discussed by the greatest Danish linguist before Rask, namely *Jens Høysgaard* (1698–1773), 3rd university caretaker (out of three), and later bell-ringer at the University Church Trinitatis (see [Basbøll, 2014a, 2016, 2018]). He was *the discoverer of Stød*, and also wrote an influential, very original 500-page Methodical Complete Danish Syntax (1752). Høysgaard (1747) proposed to write *stémpel!* 'stamp!' [or *stémpl!* with 'a very slight *e*', i.e. a syllabic *l*] but *de stèmple* 'they stamp' (in IMP PL, a verbal form extinct to-day); the accents (acute: ´ ; and gravis: `) indicate *presence vs. absence of stød* (see section 7).

In Mikkelsen's important handbook of the Danish language (1894), IMP (sg.) is said to be identical to the stem, and he mentions, for IMP forms like *ofr!* 'sacrifice!', that, sometimes, a schwa is inserted in the pronunciation [Mikkelsen, 1894, s. 209]. Aage Hansen also says that IMP has form as the INF-stem, and he states [Hansen, 1967, s. 32] that the pronunciation of problematic forms like *ofr!* is normally solved unproblematically, by inserting an *e* (like E. Hansen & L. Heltoft, cf. section 1). Diderichsen, in his standard grammar *EDG* (1946/1962), claims that INF is *formed from* IMP [Diderichsen, 1946, s. 64], which in my view is a problematic statement, in particular with respect to the spoken language. *Retskrivningsordbogen* has a better formulation [Retskrivningsordbogen, 2012, s. 972–973], viz. that IMP is formed from INF by subtracting a final "unstressed *-e*" (if there is no such *-e* in INF, IMP equals INF). Finally, a very detailed account of the phonetic/phonological aspects of IMP formation in Danish is found in the comprehensive Danish pronunciation dictionary, by Brink [Brink et al., 1991, s. 1647–1649].

Hans Jørgen Uldall (co-founder of Glossematics with Louis Hjelmslev, cf. [Basbøll, 2017a]), in his 'Phonematic' analysis of Danish (1936, based upon the principles of Hjelmslev's (1936) proposal), concluded, from IMP forms like *slubr!* 'slurp!', *klatr!* 'climb!', *vikl!* 'disentangle!', that the "*imperative is normally formed by subtraction*" [viz. from the INF], and he therefore *excluded all IMP-forms*, as did later Martinet

(1937) and Vestergaard (1968). But the problem is that *the final clusters of IMP-forms are phonotactically quite heterogeneous*: some are actually occurring, other clusters are accidentally not occurring — called accidental holes or gaps — and the rest represent several different types of phonotactical conflicts (see section 5).

In a generative phonological framework, Stephen R. Anderson [Anderson, 1975, p. 48–50] — based upon data and analyses of Rischel (1969) and Basbøll (1970, 1971, 1972) — discusses and reanalyses Danish imperative formation as an interplay between morpholexical and phonological rules. Anderson argues that Danish IMP is one of several examples that a phonological rule should precede a morpholexical rule (contrary to conventional rule application). Anderson's account of Danish phonological structure is partly mistaken, since he claims stressed syllables to have either a long vowel or a long consonant (or consonant cluster), but Danish does *not* have long consonants in types like *spille* — erroneously transcribed by Anderson with geminate consonant (here [ll]) before [ə] — as do most forms of Swedish and Norwegian. But in my view Anderson is correct in claiming — in his framework of the early 1970s and in agreement with Basbøll (1970) in particular — that the lengthening of the vowel in e.g. the noun PL *bade* [ˈb̥æːð̥ə] (very distinct, normally [ˈb̥æð̥]) and the homophonous INF *bade*, compared to the basic sg. *bad* with short vowel (without stød): [b̥að̥], should be due to a phonological rule, and that the IMP *bad!* — with stød-vowel and the quality of long /a:/: [b̥æːˀð̥] (very distinct) or [b̥æð̥ˀ] — would then be derived from the INF by subtracting schwa. This must be a morpholexical rule in Anderson's framework, even though, still according to his 1975-article, it should apply after the vowel lengthening rule. See sections 6–9 for my analysis of such forms.

In many frameworks, IMP is analysed as being expressed by a zero morpheme. An interesting recent contribution to the discussion of zero signs, in Danish and in general, is given by Juul Nielsen [Juul Nielsen, 2016, p. 192–251]. I cannot discuss this complex issue here (cf. [Basbøll, 2009] for a summary of my own position, and 2005, e.g. 352f, 369, and 2014b), but see section 6 below.

3. DIFFERENT PROPOSALS TO ACCOUNT FOR PHONOTACTICS

Five different approaches to phonotactics, in particular to sonority or strength hierarchies, have been distinguished in my earlier work (e.g. [Basbøll, 2005, p. 173–177]:

(i) *Language-specific inductivism* (e.g. [Sigurd, 1965, Vestergaard, 1968]: one tries to find generalizations from phonotactic patterns observed in a given language.

(ii) *Cross-language inductivism*; this is a common approach e.g. in structuralist linguistics, where one generalizes from observed phonotactic patterns in a variety of different languages (in principle, in as many and as typologically different languages as possible).

(iii) *Phonetic primitivism*: sonority is believed to be an objective phonetic property which can be observed, and measured e.g. acoustically (of course, the great phonetician and general linguist Otto Jespersen cannot be called primitive in any way, but he refers to O. Wolf whom I would categorize as such, according to Jespersen, note 1 [Jespersen, 1897–99, s. 524].

(iv) *Nativism/innatism*: this term can be applied, I think, to many works in the Chomskyan tradition (Generative phonology and its offsprings like Metrical etc. phonology); the central tenet is that prosodic patterns are derived from complex — innate — formal structures (belonging to the *faculté du langage*, or Universal Grammar).

(v) *General-phonetic deductivism*: The *Sonority Syllable Model* which is the topic of the next section.

4. THE SONORITY SYLLABLE MODEL IS DEDUCTIVE AND BASED UPON GENERAL PHONETICS

4.1. The vocoid is the prototypical peak of a syllable

All languages have vocoids as peaks, only some have non-vocoids = contoids as peaks (as in the Czech word for 'wolf' *vlk*); all languages have contoids as non-peaks, only some have vocoids ("glides, semivowels"); thus *vocoids are prototypical peaks*; since the peak-function is central in the notion of the syllable, the point of departure here is the vocoid, not the vowel in a functional sense, including the peak-function of a syllable: this would be circular (cf. [Ohala, Fukumori, 1997, Ohala, 1992, 2008]).

Ladefoged aptly says about his feature *Consonantal* [Ladefoged, 1971, p. 91]:

> "This feature has a different status from all other features in that it can be *defined* only in terms of the intersection of classes already defined by other features. Thus nonconsonantal sounds are nonlateral and sonorant [and also oral/HB]. They correspond largely to what Pike (1943) called vocoids, which he defined as central resonant orals".

In my view, *cover features* (as Ladefoged calls them) *are preferable* to independently defined features, other things being equal (if we adhere to Occam's razor principle of simplicity); this is particularly true for Major class features.

4.2. Definition of the vocoid

[vocoid] $=_{DEF}$ *[sonorant, –stop, –lateral]*

The features used here are all strictly binary, with no use of "ambiguous zeroes". The marked (phonetically homogeneous) member of the opposition has no '+', i.e. the '+' is implied. Thus [vocoid] means exactly the same as [+vocoid], because vocoids constitute a phonetically homogeneous class; their opposite member — contoids in Pike's terminology — do not constitute a similarly homogeneous class, since they include plosives and fricatives as well as sonorant laterals, for example. In the following, I write feature names — regardless of their specification with plus or minus — without square brackets but starting with a capital letter (e.g. Vocoid).

Sonorants are defined acoustically (following [Ladefoged, 1971, p. 58]: "a comparatively large amount of acoustic energy within a clearly defined formant structure", cf. p. 93: "greater acoustic energy in the formants"); they are — as their complementary class (obstruents), by the way — phonetically homogeneous.

4.3. Sonority-hierarchical features and segment types

1) The point of departure is the prototypical syllabic peak, which is a vocoid (a phonetic — as against "functional" — vowel, to avoid circularity), cf. above.
2) All vocoids are, necessarily, sonorant: this follows from the definition.

3) But some sonorants are not vocoids, viz. prototypical (sonorant) laterals, which are [sonorant, lateral], and nasal contoids — in Pike's (1943) terminology, i.e. phonetic consonants — which are [sonorant, stop].

ERGO: [vocoid] IMPLIES [sonorant] (and not the other way round)

Furthermore, the following implications apply:

1) All sonorants are, *necessarily*, voiced: this follows from the definition applied here [Ladefoged, 1971, p. 58, 93] combined with the phonetic (articulatory and acoustic) fact that in order to achieve sufficient acoustic energy in the spectrum, the vocal chords must vibrate.
2) On the other hand, there are non-sonorant sounds — called obstruents — that are voiced.

ERGO: [sonorant] IMPLIES [voiced] (and not the other way round)

The implications of the argument given so far in this section can be depicted by means of a set of (concentric) Euler's circles as seen in Fig. 1 [Basbøll, 2005, p. 182].

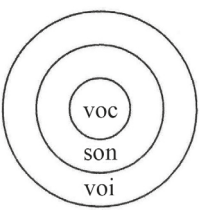

Fig. 1. [Basbøll, 2005, p. 182]. Three (concentric) Euler's circles representing the implications [vocoid] > [sonorant] > [voiced]

Furthermore, all [voiced] segments are *necessarily* [–spread glottis]: a widely spread glottis cannot vibrate (this claim is challenged below in the present section, however). The full set of implications — up to this point — can be depicted by adding a circle specified as [–spread glottis] outside the circle specified as [voiced], as seen in Fig. 2 [Basbøll, 2005, p. 195]. The outermost *circle ring* of Fig. 2 — or more technically: the outermost annulus in the mathematical (geometric) sense — represents what is outside the *circle* with [–spread glottis] segments, viz. the segments that are *not* [–spread glottis], i.e. they are [spread glottis].

There is a problem, however, in the full set of Euler's circles represented in Fig. 2, viz. that it *presupposes* that *[voiced, spread glottis] be an (in the logical sense) excluded segment type.* Here, it is relevant to consid-

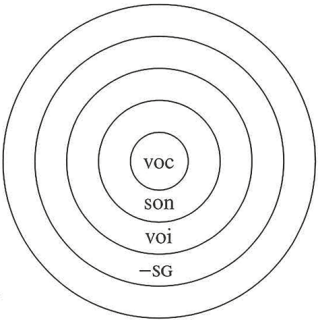

Fig. 2. [Basbøll, 2005, p. 195]. Five (concentric) Euler's circles representing the implications [vocoid] > [sonorant] > [voiced] > [–spread glottis]. The outermost circle ring represents the complementary set to the set of [–spread glottis] segments, viz. those that are [spread glottis].

er the so-called voiced aspirated plosives (oral stops) in many languages, as in e.g. Hindi, and also breathy or murmured vowels. I shall take the position here that [voiced, spread glottis] is *not* an impossible segment type. This means that [voiced] and [–spread glottis] cannot be part of the same version of the Sonority Syllable Model. I take Spread glottis to be a more important sonority-hierarchical feature than Voiced, in fact as important as Vocoid and Sonorant; there is no doubt in my mind that the following implication does hold:

[sonorant] IMPLIES [–spread glottis]

Thus, if breathy or murmured vowels are classified as [spread glottis], they cannot be [sonorant] in the definition used here. I do not deny, however, that they have some of the characteristics of sonorants, but they are only atypically sonorant — with a weaker first formant and overall less well-defined formant structure — and I would not classify them as vocoids. In the remainder of this paper, I shall consider two versions of the Sonority Syllable Model, one with [voiced], the other with [–spread glottis], with a preference for the latter, at least for languages with prototypical aspirated stops (i.e. voiceless).

4.4. Introduction of time: order classes

Now comes the crucial step of the modelling: by introducing the time dimension into a model which so far has been completely static — representing just the logical and empirical relations between segment types, with nothing at all about order or sequencing — *we obtain a syllable model*, see Fig. 3 and 4:

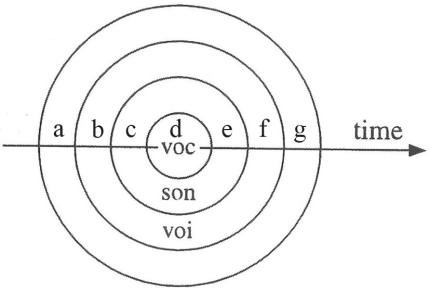

Fig. 3. [Basbøll, 2005, p. 184]. This figure is the same as Fig. 1 (with an outermost circle added) but with the dimension of time introduced and hence it is a syllable model. The letters a — b — c — d — e — f — g represent order classes

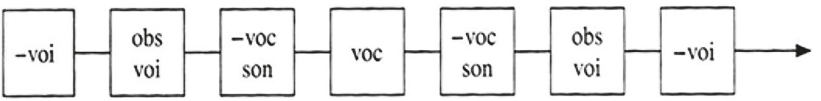

Fig. 4. [Basbøll, 2005, p. 185]. This is a notational variant of Fig. 3, where the order classes are represented by boxes with distinctive features (thus representing segment types, more precisely sonority types). [sonorant] equals [–obstruent] by definition (and by implication: [obstruent] equals [–sonorant] as well)

4.5. Major classes defined by the Sonority Syllable Model

As said, I depart from Basbøll's definition (e.g. 2001, but in fact already 1973):

[vocoid] $=_{DEF}$ [sonorant, –lateral, –stop]

which (cf. section 4.2) is inspired by Ladefoged's use of *cover features* [Ladefoged, 1971, p. 91, cf. 58, 93] drawing upon Pike's definition of *vocoids* (1943).

Departing *only* from this definition of vocoids, one can derive the five Major classes in Table 1 by means of only the three features Vocoid, Sonorant and Stop. The remaining three logical possibilities (2^3 minus 5) from these three binary features are excluded by the very definition which is a considerable simplification (according to Occam's razor principle).

Table 1. **[Basbøll, 2005, p. 89]. Major classes defined by the features Vocoid, Sonorant and Stop. Redundant feature values, given the definition of [vocoid], are parenthesized**

	V	**L**	**N**	**F**	**P**	*	*	*
vocoid	+	–	(–)	(–)	(–)	+	+	+
sonorant	(+)	+	+	–	–	+	–	–
stop	(–)	–	+	–	+	+	–	+

Note that the classes (segment types) L and N only encompass sonorant members — even though voiceless nasals and laterals do occur — which are those occupying a well defined position in sonority hierarchies.

The category "liquids" is particularly ill defined in this respect, cf. that l-sounds and r-sounds may be widely different with respect to "sonority", and one should therefore be suspicious towards claims that "liquids" constitute a natural class, phonetically and phonologically.

4.6. Modeling Major classes in a two-dimensional plane

Fig. 5 illustrates how the three features Vocoid, Sonorant and Stop define five possible areas for the Major classes (segment types) of Table 1:

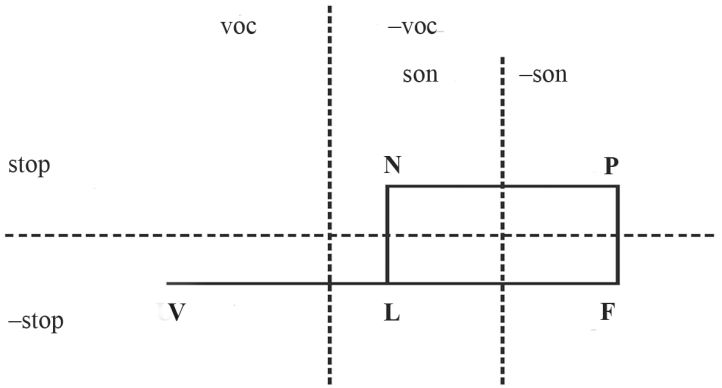

Fig. 5. [Basbøll, 2005, p. 91]. The five Major classes of Table 1 depicted in a two-dimensional graph with [vocoid] segments in the lefthand column, [–vocoid, sonorant] segments in the middle column, and [–sonorant] segments (obstruents) in the righthand column. [stop] segments occur in the upper row and [–stop] segments in the lower row

Sonority-hierarchical features are [vocoid] and [sonorant] as employed here (the only further sonority-hierarchical features are [voiced] and [–spread glottis]). *Sonority-hierarchical features are horizontal,* other features (here only Stop) are vertical. *The modeling departs from the [vocoid] in the bottom left corner. The figure is fully determined by the principles stated.* Table 2 is a notational variant of Fig. 5.

Table 2. [**Basbøll, 2017b, p. 75**]**. A notational variant of Fig. 5. Redundant feature values are parenthesized (all features are fully specified); furthermore [–stop] is redundant for V (all redundancies follow from the definition of [vocoid])**

	+ vocoid	– vocoid	(– vocoid)
	(+ sonorant)	+ sonorant	– sonorant
+ stop		**N**	**P**
– stop	**V**	**L**	**F**

4.7. Measuring distances between Major classes

In the Sonority Syllable Model, Stop is different from the two other features in that it cannot enter into any unidirectional implication chain with [vocoid] in the center — i.e. [vocoid] implies [sonorant] implies [voiced]; or [vocoid] implies [sonorant] implies [–spread glottis] — since it is not true, e.g., that [sonorant] segments are necessarily [stop] (cf. sonorant laterals), nor that [stop] segments are necessarily sonorants (cf. plosives).

The distances are measured in a "binary" way, i.e. a Major class (segment type) is either in a particular field, or it is not, *tertium non datur*.

It makes sense to count in two different ways, see Table 3:

in *sonority-steps strictly speaking* (the horizontal dimension in Fig. 5);

or in *distance from V* (since nasals and plosives (both [stop]) are clearly more distant from V than L or F, respectively, since V, by definition, is [–stop]).

The *sum of these two measures of distance* seems to capture an intuitive notion of "strength" as often employed in the literature (as well as of "sonority", whose values are inversely proportional to those of "strength").

Table 3. **[Basbøll, 2001, p. 91). Calculations of sonority-steps and distance-from-V, and of their sum, for the five Major classes of Table 1 (and Fig. 5 and Table 2)**

Major class in Table 1, Fig. 5 and Table 2	**V**	**L**	**N**	**F**	**P**
sonority step	0	1	1	2	2
distance from V	0	1	2	2	3
Their sum	**0**	**2**	**3**	**4**	**5**

4.8. A hierarchy with seven steps defined by the Sonority Syllable Model

The optimal sonority hierarchy for languages with aspirated (voiceless) plosives — such as Danish, as presented in this paper — is illustrated in Table 4. As argued above, the other viable sonority hierarchy compatible with the Sonority Syllable Model, viz. the one that includes [voiced] but not [–spread glottis], is relevant for languages with a pure voice contrast, but no relevant aspiration, such as Russian, for example (I am taking the methodologically strong position that [voiced, spread glottis] is *not* an excluded segment type, cf. section 4.3).

Table 4. **[Basbøll, 2017b, p. 76]. Seven Major classes in four columns (with [vocoid], [–vocoid, sonorant], [–sonorant, –spread glottis] and [spread glottis], respectively). Same conventions as for Table 2**

	+ vocoid	– vocoid	(– vocoid)	(– vocoid)
	(+ sonorant)	+ sonorant	– sonorant	(– sonorant)
	(– spread glottis)	(– spread glottis)	– spread glottis	+ spread glottis
+ stop		**N**	**P unasp**	**P asp**
– stop	**V**	**L**	**F voiced**	**F unvoiced**

When the seven Major classes of Table 4 are represented in terms of *sonority-steps* and *distance from V*, the result is a strength hierarchy that in my opinion is the phonologically optimal table for languages with aspirated (voiceless) stops, see Table 5:

Table 5. [**Basbøll, 2017b, p. 76**]. **Calculations of sonority-steps and distance-from-V, and of their sum, for the seven Major classes of Table 4**

	V	**L**	**N**	**F voiced**	**P unasp**	**F unvoiced**	**P asp**
sonority step	0	1	1	2	2	3	3
distance from V	0	1	2	2	3	3	4
Sum of these	**0**	**2**	**3**	**4**	**5**	**6**	**7**

5. FINAL IMP-CLUSTERS IN DANISH AND A PROPOSED METRIC FOR PHONOTACTIC DEVIATION

The seven-step-hierarchy of strength (or sonority) of section 4.8 furnishes an empirically adequate model for many languages with complex phonotactics, e.g. modern Danish. For initial position (which is not the focus here), the order of all initial consonant clusters is predicted by the model, with the sole reservation that initial /r/ is to be considered a sonorant contoid (like /l/); I cannot go into that here (see [Basbøll, 2005, p. 203–210] for discussion and data, espec. Table 7.2). It is noteworthy that the order of /s/ + (unaspirated) plosive is *predicted* (and not an exceptional case demanding special treatment, as in many other sonority or strength hierarchies).

For IMP-formation, the final clusters are relevant. Here I take the *isolated monomorphemic monosyllable* as my point of departure, which means that the final segments tend to have [spread glottis] (cf. [Basbøll, 2012] for the nature of monosyllables in this context). The contrastive segments are classified according to order classes in [Basbøll, 2005, p. 215] (but in that version, there was no distinction within the voiceless segments). According to the seven-step model used in the present paper, the classicifation of final consonants in clusters in modern Danish is as follows (with the sums of Table 5):

0 ð̥ ɐ̯ (ɪ̯) (ʊ̯)
2 l
3 m n ŋ
4 v j
5 b̥ d̥ g̊
6 f s (ɕ)
7 (pʰ) (tˢ) (kʰ)

The segments in parentheses are not considered phonemes in the final analysis [Basbøll, 2005], but they are the relevant segments in the phonotactic analysis (as against the abstract phonemes of [Vestergaard, 1968], for example, see [Basbøll, 2005, e.g. 176]). *All sequences of segments in final clusters of the isolated monomorphemic monosyllable are predicted by the model*, with the sole exception of the cluster ʁ̞ʊ̯ which is neither predicted nor excluded, but merely permitted (in e.g. *bjerg* [b̥jæʁ̞ˀʊ̯] 'mountain' and *djærv* [d̥jæʁ̞ˀʊ̯] 'bold', the latter also with a very distinct pronunciation ending in [ʁ̞v]: [d̥jæʁ̞ˀv] — which is predicted).

Very many IMP-forms have final clusters (including zero or one consonant) which also occur in other words, e.g. *føl!* [føːˀl] 'feel!', *se!* [seːˀ] 'look!', *kæmp!* [kʰɛmˀb̥] or [kʰɛmˀpʰ] 'fight!', and so forth. Other IMP-forms end in clusters which do not occur in other words, but nevertheless are not aberrant at all, i.e. they are *accidental holes or gaps*: e.g. *skeln!* [sg̊ɛlˀn] 'distinguish!' is pronounced as a true monosyllable — not presenting problems to Danish speakers — even though no other monosyllables are found that end in [ln]; but there are monosyllables ending in the phonologically similar cluster [lm], e.g. *halm* [halˀm] 'straw'. Also IMP-forms with final clusters consisting of ð̞ followed by a sonorant, e.g. *vidn!* [viðˀn] 'witness!', *padl!* [pʰaðˀl] 'paddle!', can be pronounced as true monosyllables, even though no other monosyllables are found that end in [ð̞n] or [ð̞l].

But other IMP-forms do present problems to Danish speakers, their final clusters being aberrant, i.e. structurally deviant. Whereas *skeln!* as noted above is a perfect monosyllable, this is not the case for the reverse final cluster [nl]: *handl!* 'trade!' is normally pronounced as a disyllable (with syllabic [l̩]): [ˈhanˀl̩]. When an /l/ follows a voiceless consonant, as e.g. in *rasl!* 'rattle!', the speaker has a choice between the disyllabic pronunciation in [sl̩]: [ˈʁɑsl̩], or a pronunciation with voiceless /l/, viz. in [sl̥]: [ʁɑsl̥]; the former choice is undoubtedly the preferred one.

The following examples (not the analysis) are taken from E. Hansen [Hansen, 1981, s. 238–239]. The numbers (still) refer to Table 5 above. *Notice that final /r/ is a vocoid (a V)*, according to my analysis. Examples with final /r/ are considered after other final clusters. In the Sonority Syllable Model, a vocoid cannot be voiceless (see sections 4.1–4.2); this means that if a final /r/ is devoiced, it will be an obstruent, i.e. belong to step 6 (voiceless fricatives). Likewise a devoiced L and a devoiced N will belong to step 6. The reason that plosives in pre-final position in

these IMP-forms are classified as step 5, with [–spread glottis] — and not step 7 (with [spread glottis]) — is that we depart from the pronunciation of the INF-form where the plosives occur in prevocalic position (before schwa), and where in general only the unaspirated plosives are found (given the neutralisation between the two stop series in this position).

N + L: *fuml!*	3 + 2
unasp P + N: *åbn! slukn! tætn!*	5 + 3
unasp P + L: *knebl! vikl! stipl! betl!*	5 + 2
unvoi F + N: *visn!*	6 + 3
unvoi F + L: *rafl! rasl! veksl!*	6 + 2
Examples with final /r/:	
L + V: *pylr!*	2 + **0**
N + V: *hamr!*	3 + **0**
unasp P + V: *sikr! kapr! klatr!*	5 + **0**
unvoi F + V: *blafr!*	6 + **0**

I propose that the numbers — from the strength or sonority hierarchy of section 4.8 — applied above can function as a *metric for deviation from the regular sonority slope of final consonant clusters* (and, mutatis mutandi, for sonority slopes in other positions as well). My hypothesis would be that increasing values (in strength) would be the expected (i.e. predicted) situation, that identical values would be possible (i.e. permitted, but not predicted), and that decreasing values would be unexpected (i.e. contrary to prediction). Furthermore, the hypothesis seems reasonable to me that the larger the number of steps in the non-expected direction, the greater the deviation (e.g. 5-3 would be a smaller deviation than 6-3 which again would be smaller than 6-2). But this is just a hypothesis — or only a suggestion — which should be tested and modified, partly by studying real speakers' behaviour (to what extremes do Danish speaker-hearers go in order to avoid the strange IMP-forms, for example?), partly by applying the system to other languages and modify it accordingly.

Lists of consonant clusters are given, among others, by Vestergaard (1968), based upon the 1955-edn. of *Retskrivningsordbog*. And Jespersen, in the 3rd edn. (1934) of *Modersmålets fonetik* (1st edn. 1906), added a "Phonological overview" (p. 162–175) covering the system of vowels, consonants and prosody, with a list of consonant combinations.

6. PROSODY OF DANISH IMP: VOWEL QUANTITY

We now turn to *verbs zero-derived from nouns* (native, simplex verbs): *bad* 'bath', noun with short /a/ and the approximant "soft d" (no stød) [b̥að̞], but *bade* 'baths', PL of the above-mentioned noun, with long vowel [ˈb̥æːð̞ə] (this is *very* distinct — normally the vowel will be (stylistically) shortened, and /ə/ assimilated to the preceding vocoid ð̞: [ˈb̥æð̞]). The verb *bade* 'bathe' is zero-derived from the noun *bad*; the verb is pronounced just as the noun PL *bade*.

The vowel length (in the verb, derived from the (sg.) noun) is currently *not* due to a phonological process — lengthening in open syllables –, but a lexically restricted rule (details in [Basbøll, 1970]); IMP is expectedly *bad!* with long vowel (/V:/), with stød — which is retained even when the vowel is (stylistically) shortened — and with the quality of long /a:/ (regardless of stylistic shortening): [b̥æːˀð̞] (very distinct) or [b̥æð̞ˀ]. The IMP is thus, expectedly, formed by subtracting schwa from INF (see sections 7 and 9.3 for the stød in these IMP-forms).

The noun *spil* 'play (noun)' is pronounced with short /e/ and no stød: [sb̥el]. The verb *spille* 'play (verb)' (INF), which is (zero-)derived from the noun *spil*, also has short /e/: [ˈsb̥elə] (or reduced: [ˈsb̥elḭ]). The IMP-form of *spille*, quite regularly, has short /e/ with stød in the syllable (on /l/): [sb̥elˀ]. The noun *spil* has an extraprosodic final consonant, according to Basbøll's (2008) Non-Stød Model — like many other nouns such as *ven* [vɛn] 'friend', *tal* [tˢal] 'number' — but still only a minority of monosyllables with short vowel followed by a single sonorant. This phonological structure — a short full vowel with a final extraprosodic sonorant consonant (resulting in Non-Stød) — is not possible for a verb, except the isolated IMP-forms *kom!* [kʰʌm] 'come!', *gør!* [g̊œ̯ˀ] 'do!', see below, and the present tense form *gør* [g̊œ̯] 'do(es)'.

7. PROSODY OF DANISH IMP: STØD (A LARYNGEAL SYLLABLE RHYME PROSODY)

The basic principle is (cf. [Hansen, 1943]): *Danish IMP-forms have stød if their phonological structure allows it.* In other words — according to Basbøll's Non-Stød-Model (e.g. 2008) — heavy (bimoraic) syllables (designated syllables with "stød-basis" in part of the literature) have stød as the unmarked case. There is both (1) a segmental and (2) a prosodic condition for a syllable being bimoraic: (1) it must have long sonority

in the syllable rhyme, i.e. either a long vowel or a short vowel followed by a sonorant consonant; *and* (2) it must have at least secondary stress (in a system of three degrees of stress in non-emphatic pronunciation, thereby excluding schwa as the vowel in question). The consequence of the above is that IMP-forms ending in a bimoraic syllable have stød. I only consider native verbs here (e.g. English loans generally have Lexical Non-Stød, see below). Danish *simplex verbs* are of two types according to the phonological structure of the INF-form:

a) disyllables ending in (e-)schwa (/ə/)
b) monosyllables ending in a (stressed) full vowel

a) is the general case, and as noted, they form the IMP by subtracting the (final) (e-)schwa (/ə/). There are two types of exceptions to the IMP-formation of verbs of a) as far as stød is concerned: First, two isolated verbal forms are exceptions, viz. *kom!* [kʰʌm] 'come!', *gør!* [g̊œɐ̯] 'do!'. They have LNS (Lexical Non-Stød), in words of this phonological structure resulting in extraprosodicity of the final consonant and thus Non-Stød according to the Non-Stød Model [Basbøll, 2005, p. 414–418]. Second, there is a residual of forms with older /r/ + /ptk/, like *spark!* 'kick!' where e.g. the author Karen Blixen (1885–1962) had voiceless /r/ and hence no bimoraicity in such syllables: [sb̥ɑɐ̯kʰ]. After voiceless /r/ after vowels had disappeared in the favour of a "vocalic r" (realised as [ɐ̯], or as the lengthening of the vowel resulting in [ɑː] or [ɒː]), we get the following pronunciation: [sb̥ɑːg̊] (or ending in the aspirated [kʰ], before pause), cf. [Brink et al., 1991, s. 1580]. At this stage, the IMP — and sometimes also other forms, in this case the noun *spark* 'kick (noun)': [sb̥ɑːg̊] — must have a marking of LNS. In words of this phonological structure, extraprosodicity is irrelevant: it makes no difference whether the final consonant (here: plosive) is extraprosodic or not, the syllable will be bimoraic anyhow. According to the LNS-principle, the second mora will be marked [–stød], resulting in lack of stød on this syllable throughout the derivation. The final stage is the addition of stød: [sb̥ɑːˀg̊], i.e. the loss of the marking of LNS (Lexical Non-Stød). On the contrary, forms like *gør*, also marked LNS (see above), have an extraprosodic final sonorant consonant, and when e.g. a vowel-initial ending is added, the morpheme final sonorant

consonant is no longer extraprosodic: *gør'et* [ˈg̊œɐ̯ˀəð̩] (or with ə assimilated to the ð̩) 'do it!' or 'do(es) it' (not standardised). Phonologically, this can be seen as a parallel to certain inflected forms of *ven*, *tal* above, e.g. *vennen* [ˈvɛnˀən] or [ˈvɛnˀn̩] 'the friend', *tallet* [ˈtˢalˀəð̩] (or with ə-assimilation) 'the number', that have stød-addition in the definite form. All this agrees with the Non-Stød Model [Basbøll, 2008], see section 9.3.

b) The monosyllabic INF-forms ending in a (stressed) full vowel generally end in a *long* vowel. The IMP-form of these verbs are identical with the INF, and, quite regularly, both IMP and INF are thus monosyllables with stød, e.g. *se* [seːˀ] 'see', *sy* [syːˀ] 'sew', *nå* [nɔːˀ] 'reach' (both INF- and IMP-forms). Most verbs — including those just mentioned — whose stem ends in a long vowel, have monosyllabic INF — thus identical with the IMP. But some verbs have an — obligatory or optional — INF ending in e-schwa (/ə/) (details in [Basbøll, 1970, p. 17–18). Examples with obligatory e-schwa are some verbs with the stem vowel /iː/, e.g. *tie* [ˈtˢiːə] or [ˈtˢiːi] 'keep silent', *die* [ˈd̥iːə] or [ˈd̥iːi] 'suck'. Other verbs with /iː/ have monosyllabic INF, e.g. *fri* [fg̊iːˀ] 'woo', *si* [siːˀ] 'strain'. In addition to verbs with the stem vowel /iː/, there are two marginal examples with the stem vowel /aː/, viz. *a'e* [ˈæːə] or [ˈæːæ] 'caress' and *bejae* [b̥eˈjæːˀə] or [b̥eˈjæːˀæ] 'answer in the affirmative'. Verbs ending in all other stem vowels have INF ending in schwa.

There are three completely isolated IMP-forms which end in a stressed *short* vowel: the forms *gi!* [g̊i] 'give!', *ha!* [ha] 'have!', *ta!* [tˢa] 'take!' (the orthographic forms are unauthorised). Such short-vowel forms are regular in unstressed position, and since these three verbs often occur in pre-stressed position, often in lexicalised verb phrases, this is probably the historical reason for their behaviour. They are stødless, their phonological structure excluding stød (since the syllables are light = monomoraic in my terminology). They have corresponding homophonous INF-forms: *gi*, *ha*, *ta* (also not authorised orthographically). They are doublet forms to the standard IMP-forms *giv!*, *hav!*, *tag!* (orthographically authorised), in very distinct pronunciation [g̊iːˀv tˢæːˀɪ̯ hæːˀv] (corresponding to the INF [ˈg̊iːvə ˈtˢæːɪ̯ə ˈhæːvə]); they also have pronunciations ending in a long stød-vowel: [g̊iːˀ tˢæːˀ hæːˀ], ho-

mophonous with a possible pronunciation of the INF. In all these cases, stød follows the general principles. This also applies to intermediate forms — as far as reduction is concerned — of *giv!* [ǧiːˀʊ̯ ǧiʊ̯ˀ] and *hav!* [hæːˀʊ̯ hæʊ̯ˀ], and of *give* [ˈǧiːʊ ˈǧiʊ], *have* [ˈhæːʊ ˈhæʊ].

8. INTEGRATION OF SUFFIXES INTO WORD STRUCTURE: GENERAL

Now we should temporarily forget all about the stød, it is not part of the argument of this section [Basbøll, 2005, p. 354–357]. We first propose a general model for the integration of suffixes into word structure, a model that can be applied to languages with grammatical — inflectional or derivational — morphological endings (suffixes). The procedure is as follows, with a small well-defined set of answers to each question (criterion). The procedure is general, but it will be illustrated with Danish examples in section 9.1.

Basic assumption: The more independent a suffix is with respect to what precedes in the word, the more it will be expected to be integrated in the word structure

Criterion (primary): is the suffix added to NEW WORDS?
— yes, as default
— well, to a subset of new words (only)
— no, it is not

This (primary) criterion should be supplemented by two further criteria, viz. the following:

Criterion (supplementary): is the suffix ADDED TO A WORD rather than to just a stem?
— yes, always
— no, not always

Criterion (supplementary): is the suffix SIGNALLED phonotactically as an ending?
— yes, it is
— no, it is not

This procedure results in a total of five different possible degrees of integration of a suffix into the word structure (integration with a stem), viz.:

LEAST integration of a suffix with what precedes in the word:
— default ending for new words

— AND always added to a word, not just to a stem

MOST integration of a suffix with what precedes in the word:
— NOT added to new words
— AND NOT phonotactically signalled as an ending

These are the two extremes, viz. least integration and most integration. This leaves us with three intermediate degrees of integration of a suffix with what precedes in the word; they are listed here in the order of *increasing integration of the suffix*:

— default but not always added to a word;
— added to SOME new words (only);
— not added to new words but phonotactically signalled as an ending.

9. GRAMMATICALISATION IN DANISH: SUFFIXES, WORD STRUCTURE, AND THE NON-STØD MODEL

9.1. Integration of suffixes in Danish word structure

Different languages can *grammaticalise* e.g. in numbers (in inflection or conjugation): some languages have a distinction between sg. and PL only, others also have a dual, others again have no distinction in number, etc. Similarly, I would say, the acoustic/articulatory vowel space can be divided phonologically in different ways, e.g. some languages have only three vowel phonemes, others (e.g. Danish) many more, and the boundaries between phonemes can be at different locations in the vowel space. This can be called *phonologisation*, but is, in my view, also a case of *grammaticalisation*. When the general linguistic analysis of section 8 is applied to Modern Danish, the result is as follows, following Basbøll [Basbøll, 2005, p. 357–363; Basbøll, 2014b]:

LEAST integration with what precedes in the word:
— default ending for new words
— AND always added to a word (not just to a stem)

MEDIUM integration with what precedes in the word:
— default but not always added to a word;
— OR added to SOME new words (only);
— OR not added to new words but phonotactically signalled as an ending

MOST integration with what precedes in the word:
— NOT added to new words
— AND NOT phonotactically signalled as an ending

I thus claim that there are three phonologically relevant suffixal positions for Danish, or three degrees of integration of suffixes into the stem; thus my *hypothesis* is that Danish has grammaticalised the two extreme degrees in the general framework (section 8), but not making any distinction between the three intermediate degrees *as far as phonology and prosodic morphology is concerned.* Now I give a few concrete examples of this analysis:

Grammaticalisation in Danish: Examples:		
Least integration:	PL *-er* (*bil-er* 'cars')	**P3**
Medium integration:	**INF *-e*** (*elsk-e* 'love')	**P2**
(only ONE phonol.	PL *-Ø* (*nip-Ø* 'sip')	**P2**
category in Danish)	PT *-te* (*men-te* 'meant')	**P2**
Most integration:	PL *-e* (*dreng-e* 'boys')	**P1**

9.2. Danish word structure and phonological domains

These three positions for inflectional suffixes in the word structure for Danish each define a phonological domain, see Fig. 6:

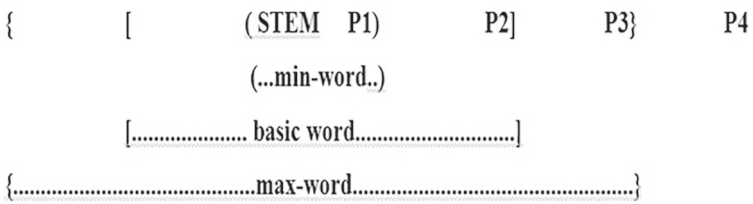

Fig. 6. [Basbøll, 2014b, p. 22, cf. Basbøll, 2005, p. 379]. Word structure in Danish based upon the three positions for the integration of suffixes established in section 9.1. P4 is the position of the clitic for POSS (|s|). P4 is outside the scope for stød.

Here are examples of the phonological consequence of the domains *min-word* and *basic word.* The phonological effect of the *max-word*, which includes P3 but not P4, is shown by the clitic |s| (for POSS) not contributing to the weight of the preceding syllable, e.g. *tals* [tˢals] 'NUMBER+POSS' having no *stød* like its non-inflected form *tal* [tˢal], whereas a corresponding monomorphemic syllable like *hals* [halˀs] 'neck' has stød, like other monomorphemic words of that phonological structure (they are bimoraic = heavy), cf. section 9.3.

Positions and integration: Phonological domains.
Segmental phonology:
Min-word (i.e.. "(....)", incl. P1):
Vowel shortening before CC
Example: *lyst* [lysd̥] 'light+NEU' (/t/ [d̥] on P1)
Basic word (i.e. "[....]", incl. P2 (regardless of what is inside)):
Dropping of "soft d" (an approximant) before /t/
Example: *født* [fɔːˀd̥] 'born+PP' (/t/ [d̥] on P2)
Word prosody: the most fascinating phenomenon in Danish: *the Stød* (section 9.3).

9.3. Danish word structure and the Non-Stød Model

The Non-Stød Model: word-structure
There are two subcases of Word-structure Non-Stød:
the *penultimate syllable* of the min-word has Non-Stød
a *monosyllabic* stem before a syllable has Non-Stød (domain: basic word)

Examples:
husenes { [(*hus e*)] *ne* } *s* 'House+PL+DEF+POSS'
[ˈhuːsənəs] or [ˈhuːsn̩nəs] **P1: *e*** **P3: *ne*** **P4: *s***
musenes { [(*mus*)] *ene* } *s* 'Mouse+PL&DEF+POSS'
[ˈmuːˀsənəs] or [ˈmuːˀsn̩nəs] **P3: *ene*** **P4: *s***
tals { [(*tal*)] } *s*, without stød [tʰals] **P4: *s***
gulere { [(*gul e*)] *re* } COMP of *gul* 'yellow'
[ˈg̊uːlɐɐ] or (very distinct) [ˈg̊uːlɐʁɐ] **P1: *e*** **P3: *re***
mentes { [(*men*) *te*] *s* } PT PASS of *mene* 'mean'
[ˈmeːnd̥əs] **P2: *te*** **P3: *s***

The difference between P1, P2, P3 and P4 is decisive for stød.

10. CONCLUDING REMARKS

1) Danish IMP has been a challenge to speaker-listeners for centuries, and it still is, — as well as to language policy.
2) There are different ways to solve the conflict between the morphological principle (*IMP = STEM*), and the phonotactical/phonological principle (*a monosyllabic word form should be a possible syllable*, is one way to frame it). The conflict is particularly strong if a final voiced segment would immediately follow a voiceless segment.
3) We need empirical investigations about: how do Danes react to this challenge? — both naturalistic and experimental data are

needed to study this question. And it is also an interesting question how foreigners learning Danish cope with the challenge of Danish imperative formation.

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ОБРАЗОВАНИЕ ФОРМ ИМПЕРАТИВА В ДАТСКОМ ЯЗЫКЕ: ПРОБЛЕМА ПРАВИЛ ВЗАИМОДЕЙСТВИЯ ФОНОЛОГИИ И МОРФОЛОГИИ

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Вопрос образования императива (IMP) в датском языке на протяжении нескольких столетий представлял собой серьезную задачу как для носителей языка, так и для языковой политики. В грамматиках он затрагивается с XVII в. Правило образования IMP в датском языке можно сформулировать следующим образом: IMP образуется путем опущения конечного шва (/ə/) формы инфинитива; в случае если инфинитив не заканчивается на шва (/ə/) — IMP = INF. Во многих случаях IMP, сконструированный таким образом, не является или не заканчивается полноценным слогом, например *hækl!* [hɛ̝ǥl] ‘вяжи крючком!’, *saml!* [sɑmˀl] ‘собирай!’. Такие формы не подчиняются иерархии сонорности и интенсивности, и существуют разные способы преодоления этой проблемы. Образование датского императива демонстрирует несколько типов конфликтов в отношении связи морфологии и фонологии и иллюстрирует несколько относящихся к ним дескриптивных и теоретических проблем: во взаимодействии морфологии и фонотактики (см. разделы 1 и 5), морфологии и просодии (см. раздел 6 о количестве гласных и раздел 7 о «толчке», слоговом гортанном просодическом явлении, имеющем сложную грамматическую дистрибуцию). Представлено последовательное изложение, основанное на сонорной силлабической модели Басбёлля — кросслингвистической модели сонорности или интенсивности (раздел 4) и его модели Non-Stød. Последняя включает в себя общую процедуру интеграции суффиксов в текстовую структуру (раздел 8) и ее применение к современному датскому (раздел 9). Рассматриваются также методологические и теоретические проблемы, но в заключение подчеркивается необходимость эмпирических исследований датского императива с целью выяснения, как носители языка и иностранцы, изучающие датский язык, осваивают сложные формы инфинитива.

Ключевые слова: императив, датский язык, фонотактика, просодия, фонология, морфология, датский толчок.

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